WGSIP

Francisco Doblas-Reyes (Barcelona Supercomputing Center BSC-CNS, Spain)

William Merryfield (Canadian Centre for Climate Modelling and Analysis, Environment and Climate Change, Canada)

JSC37, 25-27 April 2016

Environment and Climate Change Canada

Environnement et Changement climatique Canada

Barcelona Supercomputing Center
Centro Nacional de Supercomputación

SPECS
Seasonal-to-decadal climate Prediction for the improvement of European Climate Services

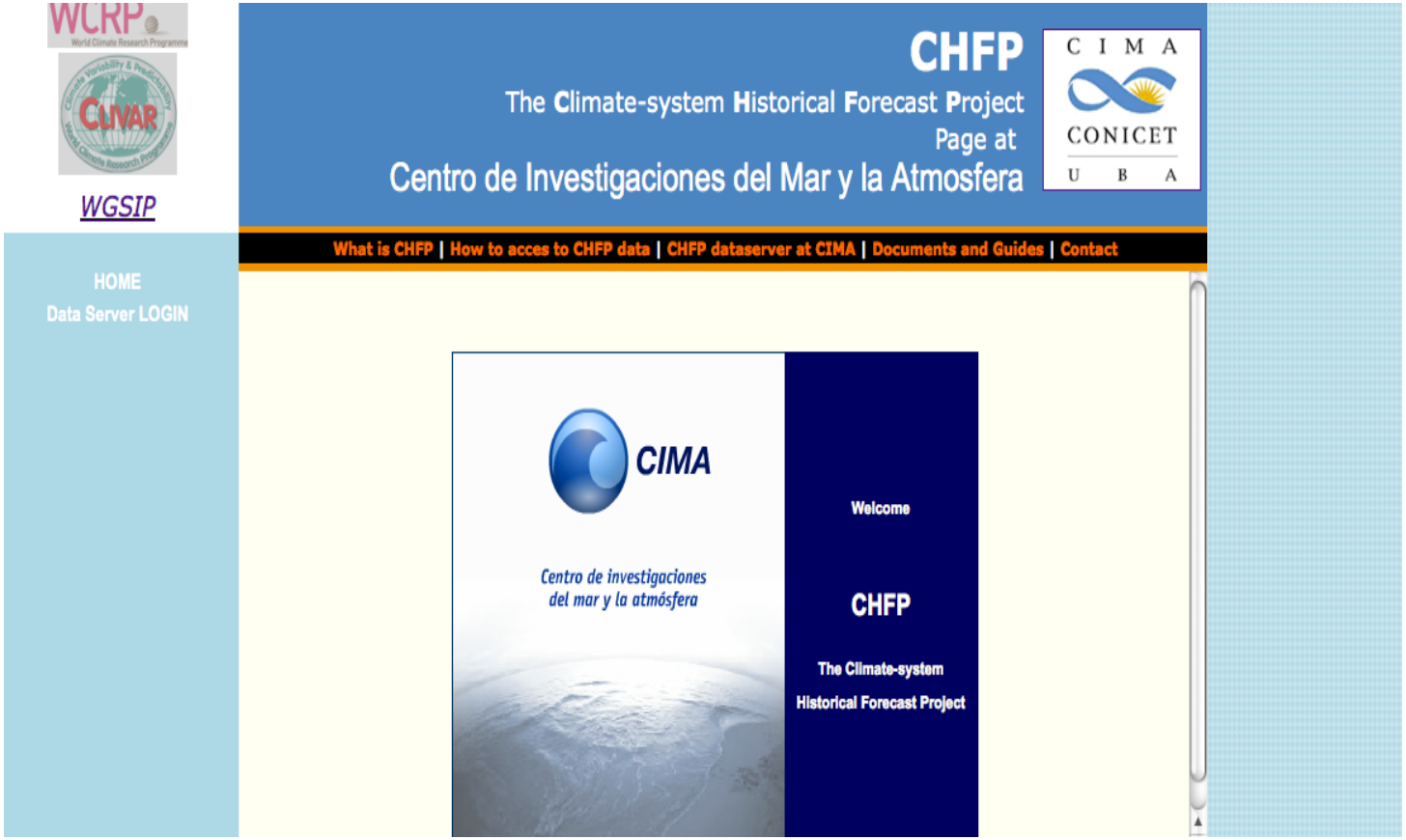
New co-chair

- Adam Scaife stood down to lead the GC on Near-Term Climate Prediction
- Bill Merryfield new co-chair proposed for approval by the JSC

Climate-system Historical Forecasting Project (CHFP)

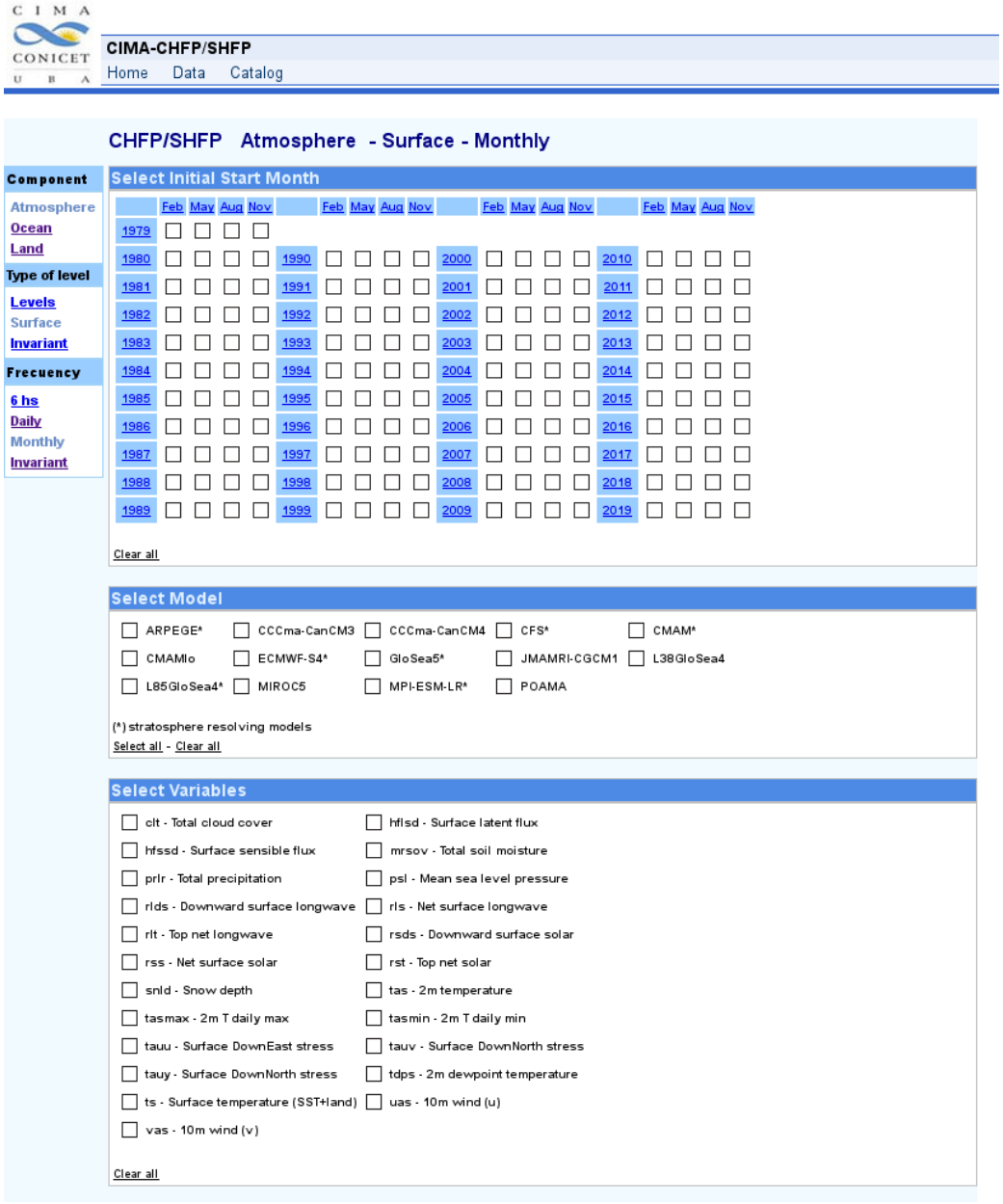
http://chfps.cima.fcen.uba.ar

- enable assessments of the seasonal prediction capabilities of many historical forecast systems by the global research community
- provide a record of the evolution of dynamical seasonal forecasting capabilities over time



Climate-system Historical Forecasting Project (CHFP)

- 14 models
- Hindcast data covering 1960-2014
- Typically 4 start dates Feb/May/Aug/Nov
- Many atmosphere and ocean variables
- Includes Strat-HFP high-top/low-top experiments
- NetCDF (SPECS convention) served via OPeNDAP
- ENSEMBLES database containing seasonal and decadal hindcasts from six European models transferred to CIMA from ECMWF
- Aim to transfer everything to an ESGF node at CIMA



Climate-system Historical Forecasting Project (CHFP)

Clim Dyn (2016) 46:2423–2434
DOI 10.1007/s00382-015-2710-2

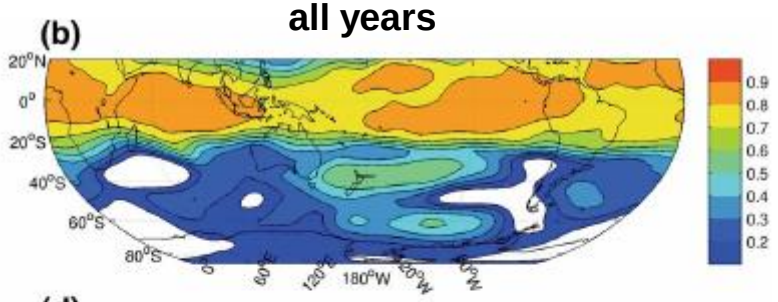
Predictability of the tropospheric circulation in the Southern Hemisphere from CHFP models

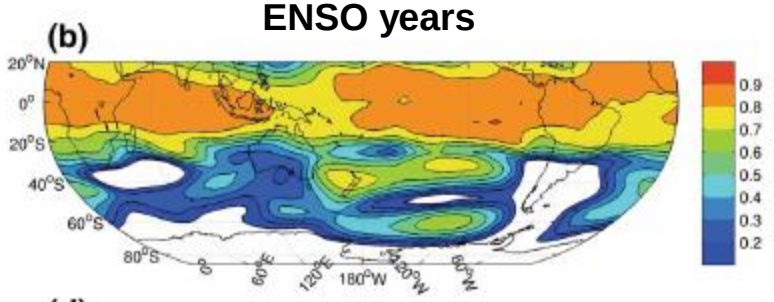
Marisol Osman[1] · C. S. Vera[1] · F. J. Doblas-Reyes[2,3,4]

JJA from 1 May anomaly correlation

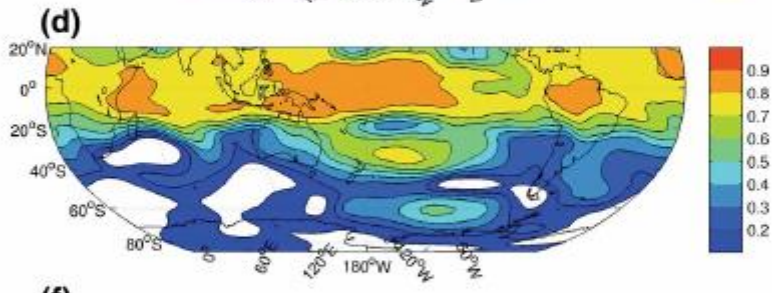
all years | **ENSO years**

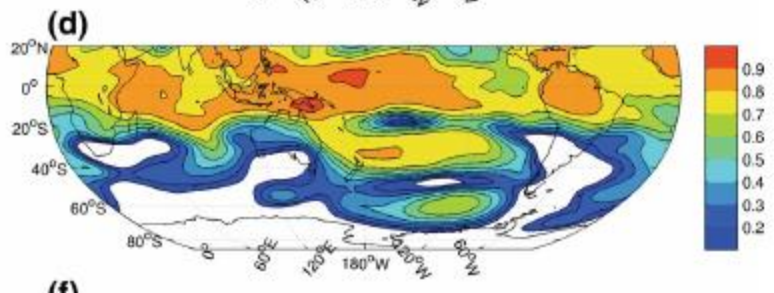
200 hPa



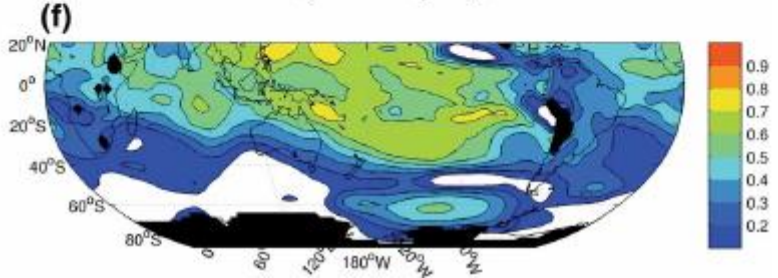


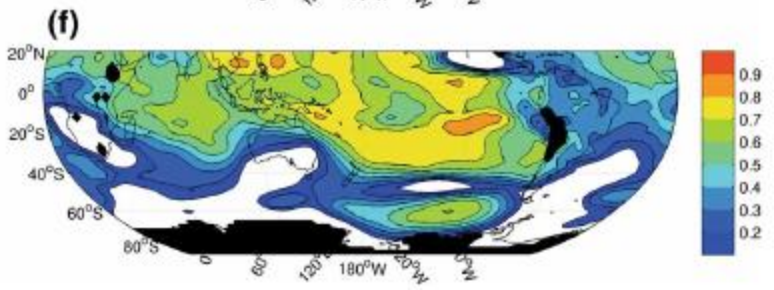
500 hPa





850 hPa



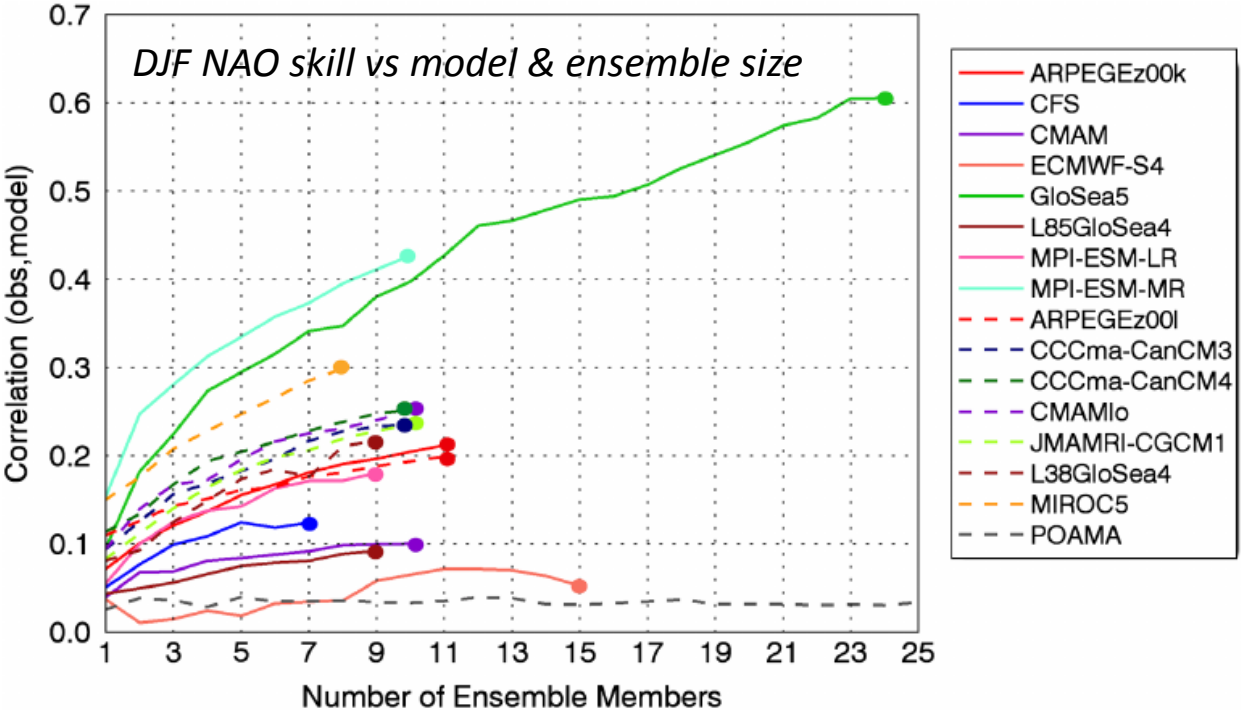


Climate-system Historical Forecasting Project (CHFP)

Quarterly Journal of the Royal Meteorological Society Q. J. R. Meteorol. Soc. (2016) DOI:10.1002/qj.2743

The Climate-system Historical Forecast Project: do stratosphere-resolving models make better seasonal climate predictions in boreal winter?

Amy H. Butler,[a,b*] Alberto Arribas,[c] Maria Athanassiadou,[c] Johanna Baehr,[d] Natalia Calvo,[e] Andrew Charlton-Perez,[f] Michel Déqué,[g] Daniela I. V. Domeisen,[h] Kristina Fröhlich,[i] Harry Hendon,[j] Yukiko Imada,[k] Masayoshi Ishii,[k] Maddalen Iza,[e] Alexey Yu. Karpechko,[l] Arun Kumar,[m] Craig MacLachlan,[c] William J. Merryfield,[n] Wolfgang A. Müller,[o] Alan O'Neill,[f] Adam A. Scaife,[c] John Scinocca,[n] Michael Sigmond,[n] Timothy N. Stockdale[p] and Tamaki Yasuda[q]



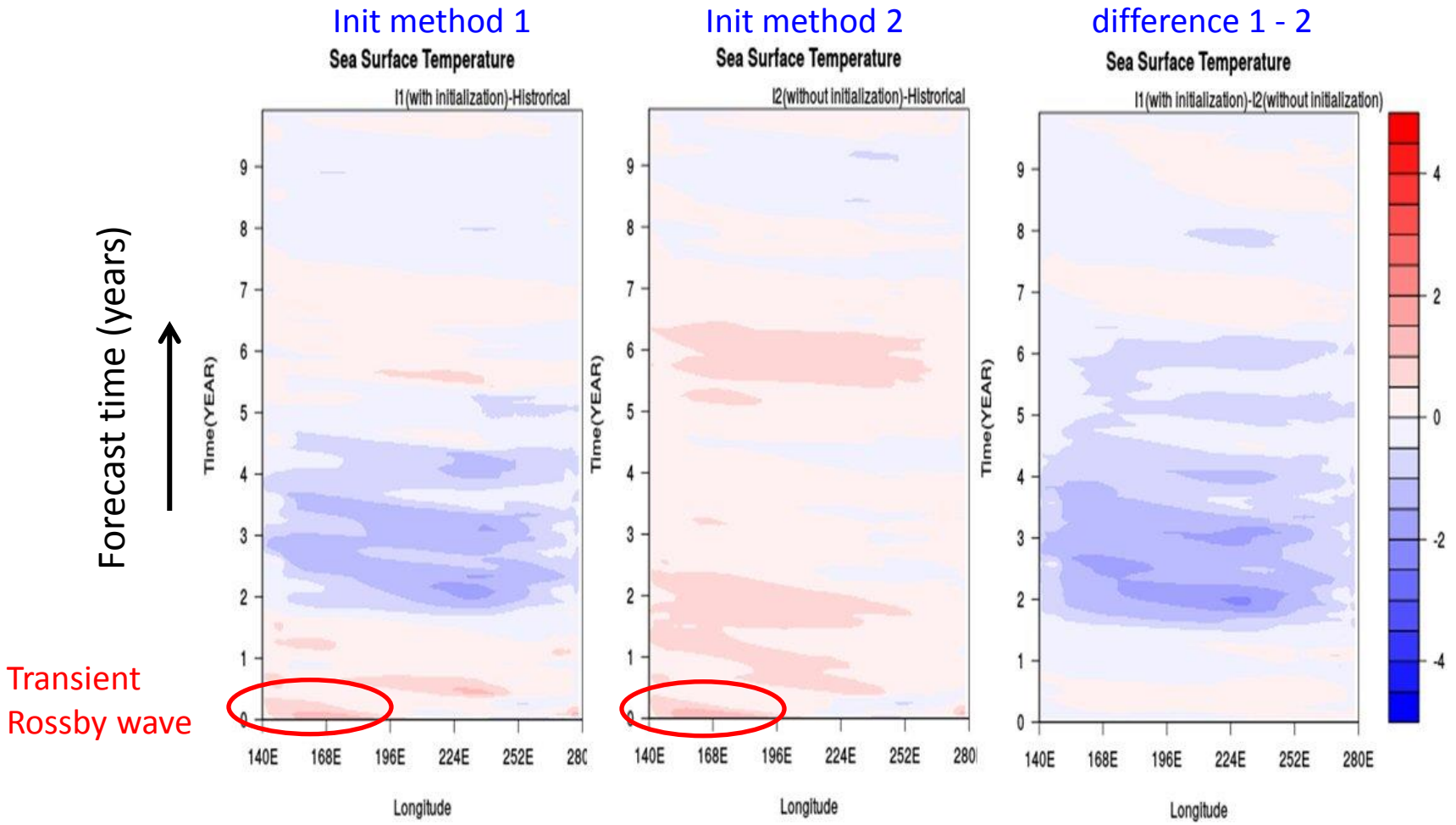
New projects: initial shock and drift

- Long-Range Forecast Transient Intercomparison Project (LRFTIP)
- Steered by **William Merryfield** (lead S2D component, Canadian Centre for Climate Modelling and Analysis, Environment and Climate Change, Canada) and **Mikhail Tolstykh** (lead S2S component, Institute of Numerical Mathematics, Russian Academy of Sciences and Hydrometcentre of Russia)
- Objectives

    1. Develop an online archive of hindcast climatologies and related diagnostics, including for other active research efforts like S2S, DCPP
    2. Address science questions, including influence of different initialization methods on transient , behavior of climate system components, and identification of any impacts (likely negative) on climate forecast quality
    3. Possibly at a later stage: perform hindcast initialization experiments (same model, different initialization methods) that will contribute to (1) and inform (2)

New projects: initial shock and drift

- Hovmoeller plots of equatorial Pacific SST (initialized-historical)
- Decadal forecasts initialized in January 1961,1966…2006
- CanCM4 model using two different initialization methods

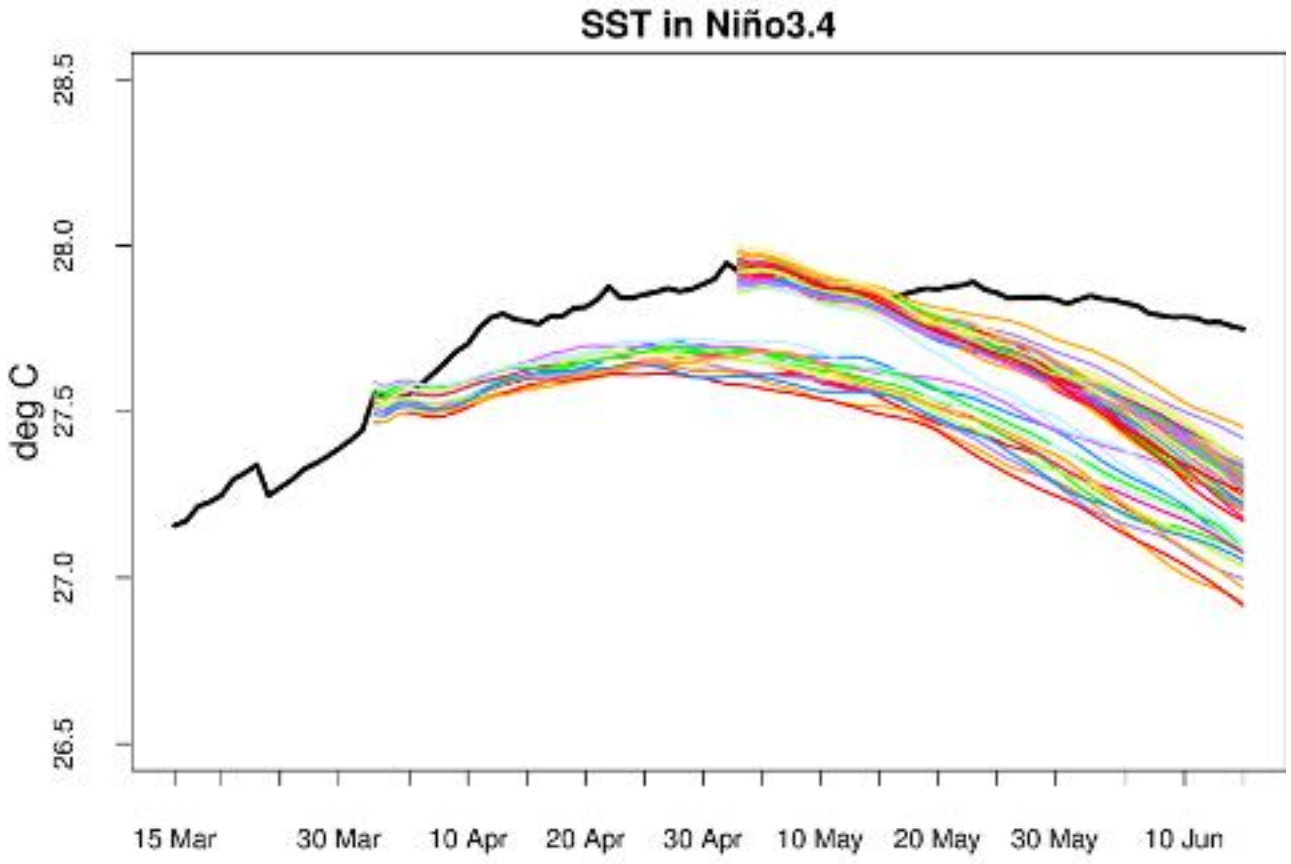


New projects: initial shock and drift

SPECS/PREFACE/WCRP Workshop on Initial Shock, Drift, and Bias Adjustment in Climate Prediction

10-11 May 2016, Barcelona, Spain

A joint initiative by SPECS, PREFACE and WCRP-WGSIP. A two-day workshop by invitation only.



New projects: SnowGLACE

- Impact of snow initialisation on subseasonal-to-seasonal forecasts
- Steered by **Yvan Orsolini** (NILU and Bjerknes Centre for Climate Research, Norway) and **Jee-Hoon Jeong** (Faculty of Earth Systems & Env. Sciences, Chonnam National Univ., South Korea)
- Links to SnowMIP, PPP and future PolarRCC
- Objectives

    1. Quantify snow initialization impacts on subseasonal-to-seasonal forecasts by evaluating how individual state-of-the-art dynamical forecast systems vary in their ability to extract forecast skill from snow initialization e.g. through stratospheric coupling and influence on the NAO.
    2. Compare twin forecast ensembles with realistic or else some sort of unrealistic snow initialisation (e.g. climatological or “scrambled”); analogous to GLACE 1 and 2 initiatives aimed at assessing the impact of soil moisture on seasonal forecasts; experiments relevant both for the assessment of forecasting skill and attribution of climate variability and extreme events to snow forcing.

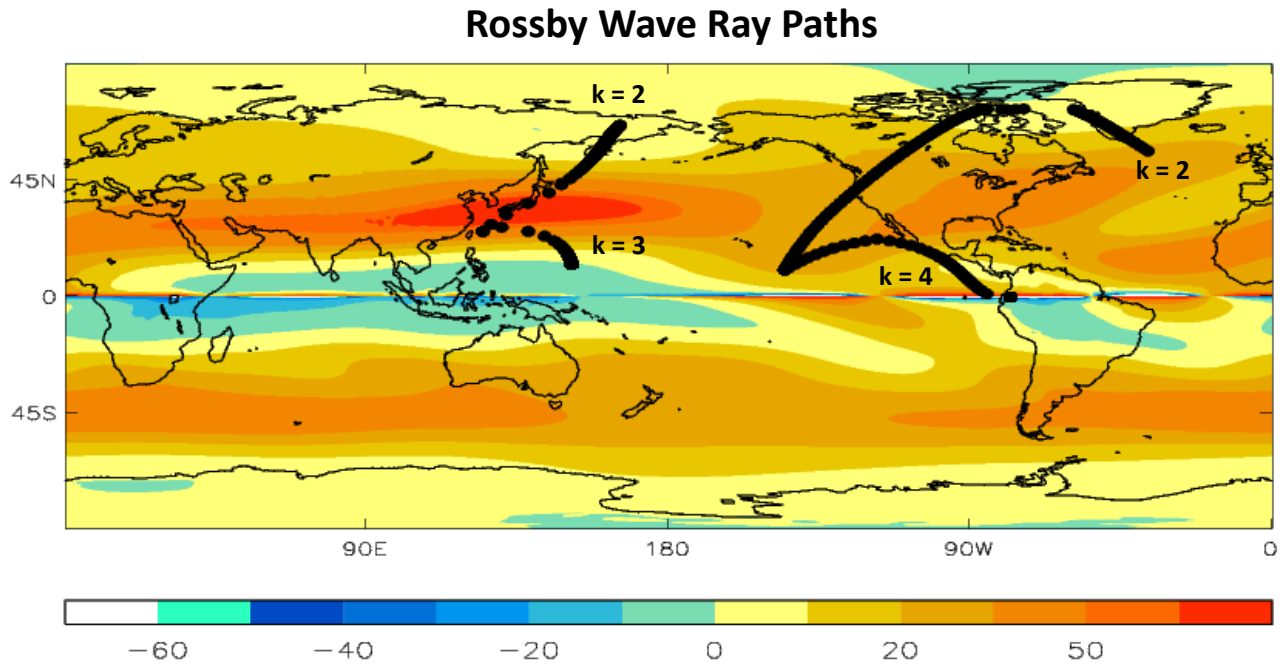
New projects: Teleconnections

- Analyse tropical-extratropical interactions at seasonal and sub-seasonal time scales in different forecast systems and observational data sets using a common framework for a straightforward intercomparison
- Steered by **Laura Ferranti** (ECMWF) and **Adam Scaife** (Met Office, UK)
- Links to similar S2S project
- Objectives

    1. Base the work on the fact that tropical rainfall which is highly predictable drives Rossby waves through upper level divergence; the resulting influence on circulation responsible for substantial portion of extratropical seasonal predictability
    2. Focus on the variability of the NAO and PNA and how they are associated with precipitation, 2m temperature and SST anomalies on a global scale; assess their dependence on the mean climate, seasonal cycle and different phases of ENSO, tropical Atlantic variability, MJO and QBO
    3. Ultimately, assess the ability of forecast systems to skillfully predict tropical precipitation

New projects: Teleconnections

- Analyse tropical-extratropical interactions at seasonal and sub-seasonal time scales in different forecast systems and observational data sets using a common framework for a straightforward intercomparison



Lead Centre for Long-Range Forecast Multi-Model Ensembles (WMO LC-LRFMME)

http://www.wmolc.org

- Global Producing Centres contribute their data to the LC-LRFMME
- Collaboration with WGSIP has been requested for many years through ET-OPSLS
- However, no access for research outside the GPCs is given to the hindcasts or past forecasts, not even in graphical form to non-met service users

Global Seasonal Climate Update (GSCU)

http://www.wmo.int/pages/prog/wcp/wcasp/GSCU.html

- The GSCU is produced by a small group lead by the CCl and CBS
- WGSIP feedback has been requested
- No access to the GSCU is granted to non-met service institutions, although the GSCU web site says otherwise

WORLD METEOROLOGICAL ORGANIZATION

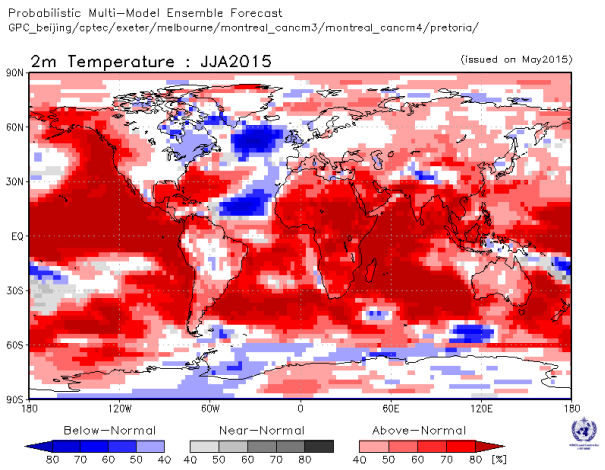
Commission for Climatology

Global Seasonal Climate Update

(TRIAL PHASE)

Issued: May 2015 **Target Season: June-July-August 2015**

Summary



Proposed WGSIP/ET-OPSLS subgroup

- Periodically reports to ET-OPSLS (timing to be determined) about potential new societally useful forecast products identified by research community
- ET-OPSLS may submit requests for a brief assessment of the current state of knowledge regarding a product of interest
- Assessments to include
    1. brief descriptions of the product itself, its potential societal usefulness (e.g. target regions/sectors), data variables and frequency required
    2. summary of existing evidence including references that the product can be predicted skillfully
- Assessments will be revisited and possibly updated with each reporting cycle until product is adopted or indicated not to be of interest by ET-OPSLS
- Alternative: instead of subgroup, WGSIP-wide activity identified in Terms of Reference

Decadal prediction

- Organised by the Decadal Climate Prediction Project (DCPP) panel
- Designed the CMIP6 contribution in 3 components with WGCM and CLIVAR
- Fundamental transfer data dissemination technology of component B -> CCl/CBS
- Meetings in Aspen last summer (component C) and in Barcelona in May (final design and coordination)

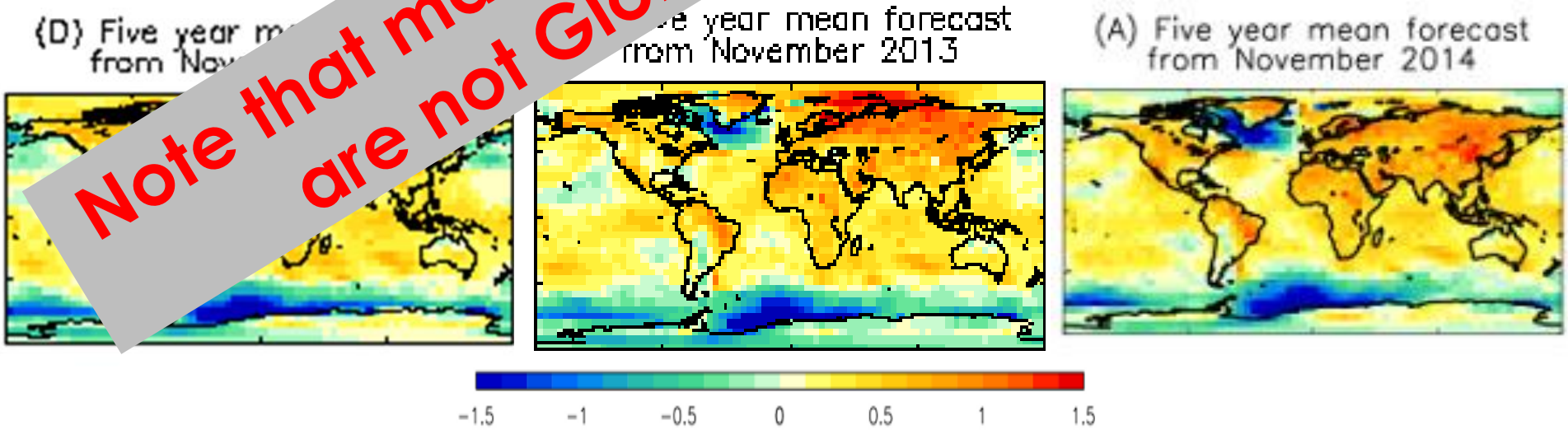
Table 1. Basic CMIP-decadal experiments

#	Experiment	Notes	# of years
PRIORITY 1: Hindcast/forecast information			
1.	Ensembles of at least 5-year, but much preferably 10-year, hindcasts and forecasts	Coupled models with initialization based on observations Start date every year from 1960 to the present Start date on or before 31 Dec of the year preceding the forecast period (start dates on or before Nov 30 allow DJF seasonal forecast results and are recommended) 10 ensemble members preferred (more if possible) Prescribed historical values of atmospheric composition and/or emissions (and other conditions including volcanic aerosols) and the RCP4.5 scenario (or its replacement) in future years	60x10x(5-10) =3000-6000yrs
PRIORITY 2: To quantify the effects of initialization			
2.	Ensembles of historical climate simulations Made with same model as used for hindcasts	1850 to present with initial conditions from a preindustrial control simulation 10 ensemble members preferred (more if possible) Prescribed historical and future forcing as for Experiment 1	170x10 =1700yrs

Decadal prediction

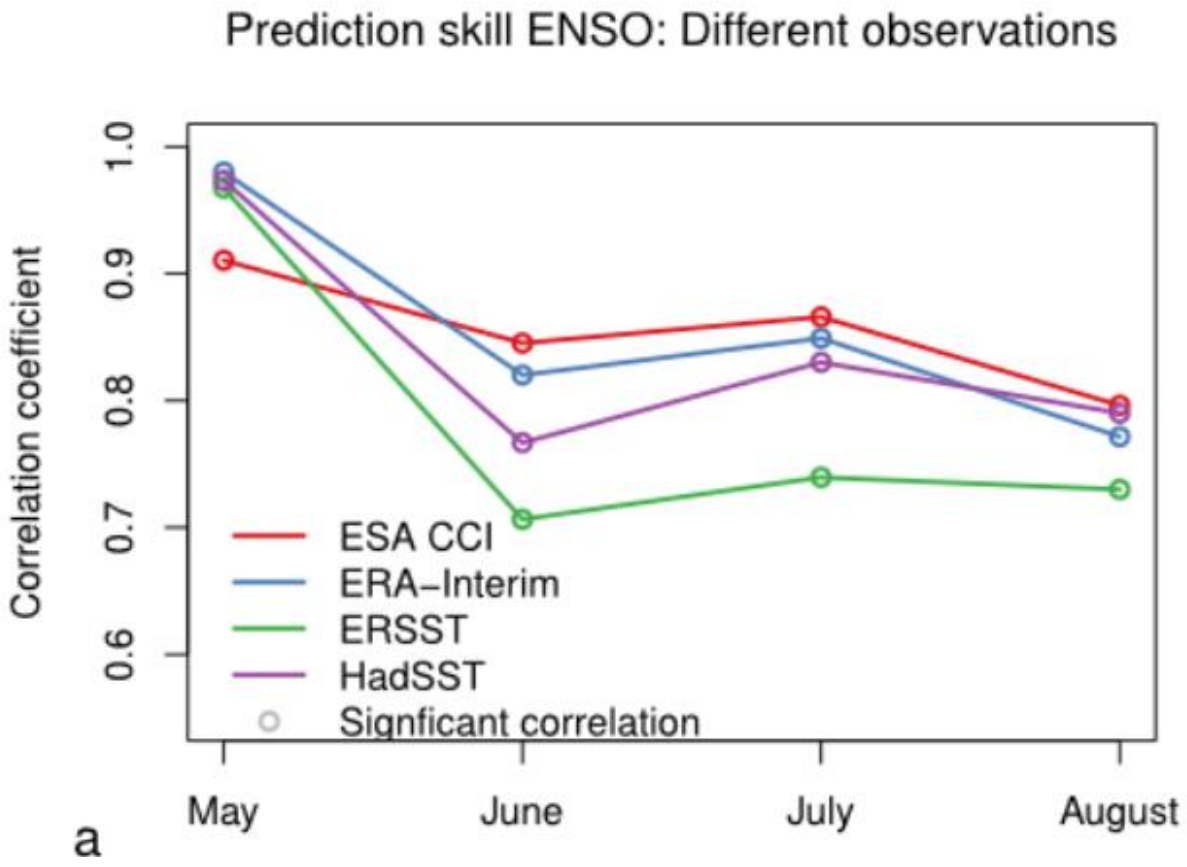
- Component B focuses on decadal forecasts (not hindcasts), which a… being made by a number of groups. It proposes a decadal pred… with the aim of the collection, calibration and combinati…
- Component C focuses on the mechanisms respon… predictability and permitting (or making diffi… …st quality
  1. Specific modes (North Atlantic … CVP
  2. Specification and impac… (link to VolMIP)
- Important data issu… …ist, double time axis -> problems to link to the WIP

Note that many contributors to component B are not Global Producing Centres



Observational uncertainty

Predictions with EC-Earth3 started every May over 1993-2009 with ERAInt and GLORYS2v1 initial conditions, and internal sea-ice reconstruction.

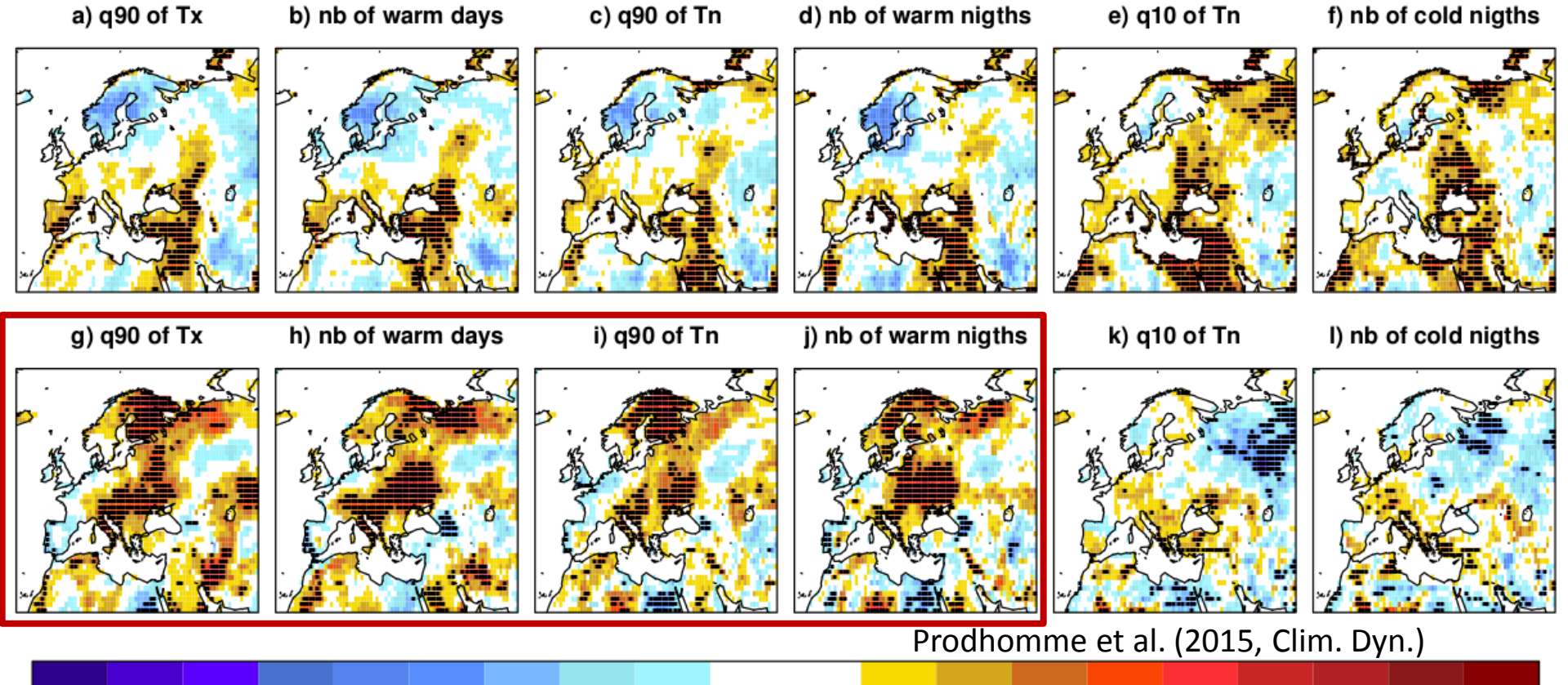


Increased resolution

- Lots of work going to global forecast systems with resolutions of around 25-50 km.
- Build on what is being done in other communities (WGNE, HiResMIP). Weather forecast systems (high resolution) moving towards coupling from day 1.
- Huge amount of work to be done in the initialisation part. Ensembles should also be large enough as forecast quality depends heavily on ensemble size. Lots of computing time and technical ability required. However, good for flagship computational projects.
- Increased resolution does not automatically improve forecast skill (even if the mean climate looks nicer).

Other links

- Polar Prediction Project: polar-lower latitudes linkages (after the hosting of the PPP-WCRP workshop in December 2014)
- GC on Extremes: participation in workshops, training and the WCE special issue
- Climate services: GFCS, CSP, RCOFs (attended the November meeting on operational climate prediction in Pune)
- Event attribution



Prodhomme et al. (2015, Clim. Dyn.)